CONTROLLED TRANSFORMATION OF PHYSICAL CHARACTERISTICS OF TRADITIONAL BULK SEMICONDUCTORS CAUSED BY LOWERING OF SYMMETRY

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S u m m a r y

The review deals with the exceptional physical characteristics of traditional bulk narrow-gap and gapless semiconductors (NS, GS – like indium antimonide and the MCT compound $Hg_{1-x}Cd_xTe$) under uniaxial stress. These characteristics can have important practical applications. The uniaxial stress lowers the crystal symmetry and modifies its band structure. In NS, the rate of radiationless Auger recombination (which is dominant in these crystals) decreases dramatically under uniaxial stress, and the rate of radiation recombination increases. This creates the possibility to increase the quantum yield gradually (in order of values), and to make these crystals not only the effective detectors in the important infrared range, but the radiators as well. The modification of NS band structure under uniaxial stress leads also to a number of important anomalies in photoelectric and photomagnetic phenomena. In GS, the uniaxial stress causes the dramatic modification of recombination processes. The phenomenon of stress-induced stimulated irradiation in THz range was both observed experimentally and explained theoretically. This phenomenon opens the possibility to construct a THz laser with modified wavelength of radiation. The uniaxial stress leads also to a modification of impurity centers in semiconductors, and it modifies the picture of recombination processes via these centers. The case of low symmetry not of the crystal lattice, but of the center itself, has also been studied. This problem is of great importance due to the intensification of studies of the isoelectronic nitrogen impurity in A_3B_5 crystals during last years.